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International application number: PCT/US05/008989

International filing date: 18 March 2005 (18.03.2005)

Document type: Certified copy of priority document

Document details: Country/Office: US
Number: 60/555,111
Filing date: 22 March 2004 (22.03.2004)

Date of receipt at the International Bureau: 09 May 2005 (09.05.2005)

Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b)



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APPLICATION NUMBER: 60/555,111

FILING DATE: *March 22, 2004*

RELATED PCT APPLICATION NUMBER: *PCT/US05/08989*



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PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

Express Mail Label No. EV 402539023 US

INVENTOR(S)					
Given Name (first and middle [if any])		Family Name or Surname		Residence (City and either State or Foreign Country)	
John Edward		Davis		Salisbury, NC - USA	
Additional inventors are being named on the _____ separately numbered sheets attached hereto					
TITLE OF THE INVENTION (500 characters max)					
LOW WICK CONTINUOUS FILAMENT POLYESTER YARN					
Direct all correspondence to: CORRESPONDENCE ADDRESS					
<input type="checkbox"/> Customer Number: <div style="border: 1px solid black; width: 250px; height: 30px; display: inline-block;"></div>					
OR					
<input checked="" type="checkbox"/> Firm or Individual Name		Gregory N. Clements			
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ENCLOSED APPLICATION PARTS (check all that apply)					
<input checked="" type="checkbox"/> Specification Number of Pages 10		<input type="checkbox"/> CD(s), Number _____			
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<input type="checkbox"/> Application Data Sheet. See 37 CFR 1.76					
METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT					
<input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27.				<div style="border: 1px solid black; padding: 10px; text-align: center;">FILING FEE Amount (\$) \$160.00</div>	
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Respectfully submitted,

SIGNATURE

TYPED or PRINTED NAME Gregory N. Clements

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[Page 1 of 2]

Date March 22, 2004

REGISTRATION NO. 30.713

(if appropriate)

Docket Number: 2004/02 Prov.

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☐ Applicant claims small entity status. See 37 CFR 1.27

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Application Number	
Filing Date	
First Named Inventor	John Edward Davis
Examiner Name	
Art Unit	
Attorney Docket No.	2004/02 Prov.

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Dougherty, Clements & Hofe A

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FEE CALCULATION

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Large Entity		Small Entity		Fee Description	Fee Paid
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1001	770	2001	385	Utility filing fee	
1002	340	2002	170	Design filing fee	
1003	530	2003	265	Plant filing fee	
1004	770	2004	385	Reissue filing fee	
1005	160	2005	80	Provisional filing fee	160.00
SUBTOTAL (1)				(\$ 160.00	

2. EXTRA CLAIM FEES FOR UTILITY AND REISSUE

Total Claims		-20** =		X		=	
Independent Claims		-3** =		X		=	
Multiple Dependent						=	

Large Entity		Small Entity		Fee Description	Fee Paid
Fee Code	Fee (\$)	Fee Code	Fee (\$)		
1202	18	2202	9	Claims in excess of 20	
1201	86	2201	43	Independent claims in excess of 3	
1203	290	2203	145	Multiple dependent claim, if not paid	
1204	86	2204	43	** Reissue independent claims over original patent	
1205	18	2205	9	** Reissue claims in excess of 20 and over original patent	
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FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Small Entity

Fee Code	Fee (\$)	Fee Code	Fee (\$)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet	
1053	130	1053	130	Non-English specification	
1812	2,520	1812	2,520	For filing a request for ex parte reexamination	
1804	920*	1804	920*	Requesting publication of SIR prior to Examiner action	
1805	1,840*	1805	1,840*	Requesting publication of SIR after Examiner action	
1251	110	2251	55	Extension for reply within first month	
1252	420	2252	210	Extension for reply within second month	
1253	950	2253	475	Extension for reply within third month	
1254	1,480	2254	740	Extension for reply within fourth month	
1255	2,010	2255	1,005	Extension for reply within fifth month	
1401	330	2401	165	Notice of Appeal	
1402	330	2402	165	Filing a brief in support of an appeal	
1403	290	2403	145	Request for oral hearing	
1451	1,510	1451	1,510	Petition to institute a public use proceeding	
1452	110	2452	55	Petition to revive - unavoidable	
1453	1,330	2453	665	Petition to revive - unintentional	
1501	1,330	2501	665	Utility issue fee (or reissue)	
1502	480	2502	240	Design issue fee	
1503	640	2503	320	Plant issue fee	
1460	130	1460	130	Petitions to the Commissioner	
1807	50	1807	50	Processing fee under 37 CFR 1.17(q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
8021	40	8021	40	Recording each patent assignment per property (times number of properties)	
1809	770	2809	385	Filing a submission after final rejection (37 CFR 1.129(a))	
1810	770	2810	385	For each additional invention to be examined (37 CFR 1.129(b))	
1801	770	2801	385	Request for Continued Examination (RCE)	
1802	900	1802	900	Request for expedited examination of a design application	

Other fee (specify)

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SUBTOTAL (3) (\$ 00.00

SUBMITTED BY

(Complete (if applicable))

Name (Print/Type)	Gregory N. Clements	Registration No. (Attorney/Agent)	30,713	Telephone	704.366.6642
Signature		Date	March 22, 2004		

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March 22, 2004
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EV402539023US)

PATENT SPECIFICATION**INVENTOR(S) JOHN EDWARD DAVIS****TITLE: LOW WICK CONTINUOUS FILAMENT POLYESTER
YARN****BACKGROUND OF THE INVENTION****1) Field of the Invention**

This invention relates to continuous filament yarns that are low wicking. Such yarns are traditionally employed in weaving signs, banners, tents and other products where moisture resistant yarn is important. In particular, the continuous filament yarns of the present invention have a wicking characteristic of about 0.25 inches or less, a contact angle of greater than or equal to about 65° but less than about 90°, and have a static voltage range of +/- 400 volts (a voltage between -400 to +400). Such continuous filament yarns are made using an aqueous dispersion of a specific fluorocarbon resin, or a mixture of a few specific resins, that is used to impart water and oil repellency to synthetic fibers. Known fluorocarbon resins that impart water and oil repellency to synthetic fibers are not capable of achieving the wicking angle, contact angle and static voltage mentioned previously.

2) Prior Art

Use of fluorochemical emulsions and specifically fluorocarbon resin emulsions to impart oil and water resistance to synthetic fibers is well known. These treatments can be applied in the form of a spin finish to impart moisture resistance in fabric made from the fiber or continuous filament. Its use as a spin finish for carpet fibers, for example, is to

impart water and oil repellency to the synthetic fibers. The following prior art illustrate these technologies.

U. S. Patent 6,536,804 to Dunsmore et al. relates to carpet fibers in which a spin finish is applied to the synthetic staple fibers (not continuous filament yarn) for creating a surface on the carpet that is water and oil repellent. As set forth in Examples 15-24 of this patent, fluorochemicals were components of the spin finish. The fluorochemicals were fluorocarbon resins.

U. S. Patent Application Publication Number US 2003/0175514 to Hancock et al. discloses a low wicking type material that has use in fabrics, which are water repellent. Specific polymers disclosed are nylons, polyesters and polyolefins. This reference also discloses that a filament has a contact angle greater than or equal to 90° as measured by the method disclosed in the Journal of Colloid and Interface Science, 177, 579-588 (1996). This reference also discloses a filament having a coating thereon and wherein the contact angle of the coated filament is greater than or equal to 90°. The coating (described as the “second longitudinally-extending component of the filament”) can be virtually any halogenated polymer as disclosed in Paragraph 29.

Although these prior art documents disclose fluorochemical based finishes to polyester yarn that results in moisture resistance, they do not disclose wicking less than about 0.25 inches. For example, Honeywell has a product called WickGard™ Anti-Wick Finish. Honeywell advertises that the fabric wicking performance when WickGard™ Finish is employed on the fabric and cured at 310°F for 15 minutes, is one quarter inch maximum. Furthermore, the prior art documents disclose a static voltage operating range greater than 400 volts. Static voltage above +/-400 volts, requires that the yarn be processed in a humid atmosphere employing the addition of static eliminators to the processing equipment, and reducing the processing equipment speed by 30% or more. On the other hand, continuous filament yarns having a static operating range of +/- 400 volts permits the continuous filament yarns to be processed into a fabric in virtually any ambient air conditions, without the need of static eliminators in the fiber forming and

fabric forming equipment, and because the continuous filament is drier, the processing equipment can be run at faster output.

SUMMARY OF THE INVENTION

The present invention teaches a continuous filament yarn that has low wicking, i.e., less than or equal to about 0.25 inches; has a contact angle of greater than or equal to about 65° but less than about 90° according to the straw method; and a static voltage of +/- 400 volts (between -400 to +400 volts).

To further illustrate that continuous filament yarns are water repellent, the yarns of the present invention have a contact angle greater than or equal to about 65°, while yarns of the prior art have contact angles less than about 65° or greater than about 90°. Those known low wicking continuous filament yarns commercially available at the present time will not have wicking less than or equal to about 0.25 inches, a static voltage of +/- 400 volts, and a contact angle greater than or equal to about 65°. The contact angle test and evaluation are described by Augustine Scientific at Newbury, OH. Like all contact angle tests, the higher the degree, the more non wetting the continuous filament is. However, it is virtually impossible to compare the contact angle determined by, for example, the straw method to the contact angle determined by packed cell method versus the contact angle as measured by the procedure set forth in the Journal of Colloid and Interface Science mentioned previously. Simply stated, these various tests give different results and are not comparable, one to the other.

With these characteristics of the prior art in mind, it is the chief aim of the present invention to have a low wicking continuous filament of less than or equal to about 0.25 inches, a static voltage of +/- 400 volts and a contact angle of at least about 65° but less than about 90° according to the straw method. Heretofore, such a continuous filament has not been known in the prior art.

The sign of the static voltage will depend on the relative position of the type of yarn and the rubbing surface on the triboelectric series. Generally polyester and nylon will be positively charged.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Thermoplastic polymers useful for making synthetic fibers of this invention include fiber-forming polyesters, poly(alpha)olefins, polyamides and acrylics.

Preferred thermoplastic polymers are polyesters are produced from the reaction of a diacid or diester component comprising at about 65 mole % terephthalic acid or $C_1 - C_4$ dialkylterephthalate, preferable at least 70 mole %, and a diol component comprising at least about 65 mole % ethylene glycol, preferably at least 70 mole %, more preferably at least 75 mole %, even more preferably at least 95 mole %. It is also preferable that the diacid component is terephthalic acid and the diol component is ethylene glycol. The mole percentage for all the diacid component totals 100 mole %, and the mole percentage of all the diol component totals 100 mole %.

Where the polyester components are modified by one or more diol components other than ethylene glycol, suitable diol components of the described polyesters may be selected from 1, 4-cyclohexanedimethanol, 1, 2-propanediol, 1, 3-propanediol, 1, 4-butanediol, 2, 2-dimethyl-1, 3-propanediol, 1, 6-hexanediol, 1, 2-cyclohexanediol, 1, 4-cyclohexanediol, 1, 2-cyclohexanedimethanol and diols containing one or more oxygen atoms in the chain, e.g., diethylene glycol, triethylene glycol, dipropylene glycol, tripropylene glycol or mixtures of these, and the like. In general, these diols contain 2 to 18, preferable 2 to 8 carbon atoms. Cycloaliphatic diols can be employed in their cis or trans configuration or as mixtures of both forms. Preferred modifying diol components are 1, 4-cyclohexanedimethanol or diethylene glycol, or a mixture of these.

Where the polyester components are modified by one or more acid components other than terephthalic acid, the suitable acid components (aliphatic, alicyclic, or aromatic

dicarboxylic acids) of the linear polyester may be selected, for example, from isophthalic acid, 1, 4-cyclohexanedicarboxylic acid, 1, 3-cyclohexanedicarboxylic acid, succinic acid, glutaric acid, adipic acid, sebacic acid, 1, 12-dodecanedioic acid, 2, 6-naphthalenedicarboxylic acid, bibenzoic acid, or mixtures of these and the like. In the polymer preparation, it is often preferable to use a functional acid derivative thereof such as the dimethyl, diethyl, or dipropyl ester of the dicarboxylic acid. The anhydrides or acid halides of these acids may also be employed where practical.

Other thermoplastic polymers are poly(alpha)olefins, including the normally solid, homo-, co- and terpolymers of aliphatic mono-1-olefins (alpha olefins) as they are generally recognized in the art. Usually, the monomers employed in making such poly(alpha)olefins contain 2 to 10 carbon atoms per molecule, although higher molecular weight monomers sometimes are used as comonomers. Blends of the polymers and copolymers prepared mechanically or in situ may also be used. Examples of monomers that can be employed in the invention include ethylene, propylene, butene-1, pentene-1, 4-methyl-pentene-1, hexene-1, and octene-1, alone, or in admixture, or in sequential polymerization systems. Examples of preferred thermoplastic poly(alpha)olefin polymers include polyethylene, polypropylene, propylene/ethylene copolymers, polybutylene and blends thereof. Polypropylene is particularly preferred for use in the invention.

Typical polyamides suitable for this invention are nylon 6 and nylon 66.

Processes for preparing the polymers useful in this invention are well known, and the invention is not limited to a polymer made with a particular catalyst or process.

The process of melt spinning the multifilament yarn is well known in the art. Through an extruder the molten polymer is fed under high pressure to the heated housing which accommodates the spinning. The molten polymer is forced through a number of spinning orifices provided in a spinneret. The filaments emerge from the spinneret as a bundle. The filament bundle may pass through a delay zone (heated or unheated) prior to

a quench zone, in which the bundle is cooled with air of room temperature, which is blown onto the filaments transverse to the direction of movement of the bundle. The filament bundle is subsequently brought into contact with the finish metering unit in which a suitable lubricant is applied to the filaments of the bundle in the usual way. Then the multifilament bundle arrives at the first of a set of advancing rolls for imparting the correct speed to the yarn bundle. The circumferential speed of the feed roll is determinative of the speed at which the filaments are spun and is therefore referred to as the spinning speed. After the spun multifilament yarn has left the rolls, it is wound into a package. The speed at which the yarn is wound will be approximately equal to the spinning speed. After the yarn has been taken up, it is drawn on a separate machine to the desired ratio. In principle, however, drawing also may be carried out on the spinning machine in a continuous spin-drawing process. In the event of the spin-drawing process known per se being applied a drawing device consisting of one or more driven rolls is to be provided between the first driven roll and the winding bobbin.

In addition to the above raw materials employed for making suitable polymers for the present invention, plastic additives can also be added. Such plastic additives may be anti-static agents, biocides, coloring agents (dyes and pigments), coupling agents, flame retardants, heat stabilizers, light stabilizers, lubricants, plasticizers and mixtures of a plurality of these.

The aqueous dispersion fluorocarbon resins used in the present invention are known by their trade names of Afilan 5248A and Afilan 5284B produced by Clariant. Additionally, trade names Lurol FC-L575 and FC-L790 produced from Goulston are likewise satisfactory. Many other aqueous dispersion fluorocarbon resins (Mitsubishi Chemical Company, 3M) have been tested but have been found to be lacking and do not provide a wicking of less than or equal to about 0.25 inches, a contact angle (as determined by the straw method) of about 65° or more, and a static voltage of less than or equal to +/- 400 volts. The aqueous dispersion fluorocarbon resins mentioned above are suitable for the present invention and provide these properties.

The aqueous dispersion fluorocarbon resins are applied to the fibers as a spin finish, for example. The aqueous dispersions are prepared to give about 15 % by weight solids with the remainder being water. Known processes of applying spin finishes to fibers are suitable for the present invention.

TEST PROCEDURES

Wicking

Wicking is determined by the distance that a dye solution wicks up the vertically suspended yarn. A 0.5 wt-% solution of Palanil Cerise NSL 200 (BASF Corporation) is prepared. A paper clip (0.5 g) is tie to one end of the yarn and suspended into a 50 ml beaker. The dye solution is added to the beaker so that it just covers the knot. After 45 minutes, the yarn is lifted out of the beaker and allowed to dry. The amount of wicking above the knot is measured.

Contact Angle

The contact angle is determined by the straw method, as explained by Augustine Scientific of Newbury, OH in bulletin number 404 by Dr. Rulison. The contact angle is the quantitative measure of wet-ability for a solid surface being wetted with a liquid, which ranges from 0 (perfect wetting) to 180° (complete non-wetting). The contact angle using the straw method may be generally described as obtaining several fibers each having a length of about 3 inches, which are laid together. A thin flexible copper wire is looped around the fibers and both ends of the wire are fed through a small piece of tubing (the "straw"). Typically Teflon tubing having a small inner diameter of about 1mm and a length of roughly 1 inch is employed. The wire is pulled so that the fibers are forced to double over on themselves and enter the tube. When you use enough fibers so that the tube becomes fairly tightly packed with fibers, you are doing the step properly. The fibers are trimmed off evenly at the bottom end of the tube and the wire is removed from the fiber loop that is created at the top end of the tube. The tube containing the fibers is

attached to the balance for experimentation using a hook through the fibers or alternative clamping technique. Porous solids can be tested for contact angle using the Washburn adsorption technique so long as the resulting contact angle is less than about 90°. The Washburn theory indicates that if a porous solid is brought into contact with the liquid, such that the solid is not submerged in the liquid, but rather is just touching the liquids surface, then the rise of liquid into the pores of the solid is due to capillary action. Washburn's equation can then be calculated to give the contact angle once you know the density, viscosity and surface tension of the liquid employed. If the contact angle is greater than about 90°, then the liquid will not rise or wick into the bundle, and the Washburn method cannot be used.

Static Voltage

The static voltage is measured by running the yarn around a 6.35 mm diameter ceramic (aluminum oxide) pin at yarn speed of 300 meters per min. with a pretension of about 65 g. The static generated is measured 48 mm from the threadline with a Monroe Electronics static voltmeter. The temperature of the test conditions is 70° F with a relative humidity of 40%.

THE EXAMPLE

A series of commercial (KoSa, Salisbury NC, U.S.A.) and experimental yarns were compared. All yarns were prepared by applying the spin finish (15% emulsion in water) to the spun yarn and used a spin-draw process. The target final finish on yarn was 0.4 to 0.6 wt-%.

TABLE 1

Sample	Wicking (Inches)	Contact Angle Degrees (°)	Static Volts
Type 787	3.18	57	18
Type 784	0.3	61.35	72
Mitsubishi fluorocarbon	1.17	59.65	208
3M fluorocarbon (no emulsifiers or antistat)	0.1	69.25	2362
Afilan 5248A	0.1	73.75	225
Afilan 5284B	0.12	82.35	216
Lurol FC-L565	0.13	68.4	119
Lurol FC-L790	0.2	n.m.	280

n.m. – not measured

Thus it is apparent that there has been provided in accordance with the invention, a continuous filament that fully satisfies the objects, aims and advantages set forth above. While the invention has been described in conjunction with specific embodiments thereof, it is evident that many alternatives, modifications, and variations will be apparent to those skilled in the art in light of the foregoing description. Accordingly, it is intended to embrace all such alternatives, modifications, and variations as fall within the spirit and broad scope of the appended claims.

What is Claimed Is:

- (1) A continuous filament yarn having wicking less than about 0.25 inches, a static voltage of +/- 400 volts, and a water contact angle greater than or equal to about 65°, but less than about 90°.
- (2) The continuous filament of Claim 1, wherein said filament is coated with an aqueous fluorocarbon resin.
- (3) Wherein said filament yarn is selected from the group of polyesters, poly(alpha)olefins, polyamides and acrylics.